

CLAIMS

1. A hybrid powertrain for a vehicle, said powertrain comprising:
 - a first source of torque;
 - a second source of torque;
 - 5 a hybrid power transmission including a pump operable for pumping transmission oil in response to torque from said first or second source; and
 - a third source of torque for operating a rotor of said pump when said pump is not being operated by any of said first and second sources of torque.
- 10 2. The hybrid powertrain of claim 1 wherein the third source of torque is an electric motor.
3. The hybrid powertrain of claim 1 wherein the first source of torque is an electric motor.
4. The hybrid powertrain of claim 1 wherein the second source of torque is an internal combustion engine.
5. An oil pump driving device for driving an oil pump with a transmission coupled to an engine for supplying working oil to lubricate the transmission, said oil pump driving device comprising:
 - a pump drive wheel rotatable about an axis and driven by the engine;
 - 5 a main transmission oil pump shaft offset from the axis of said pump drive wheel;
 - a pump-driven wheel drivable by said pump drive wheel;

a freewheeler clutch between said oil pump shaft and said pump-
10 driven wheel; and

an electric motor connected to said oil pump shaft; said
freewheeler clutch sufficiently locking said pump-driven wheel to said oil
pump shaft for driving the oil pump from said engine; and

said freewheeler clutch sufficiently releasing said pump-driven
15 wheel from said oil pump shaft for driving the oil pump from said electric
motor.

6. The oil pump driving device of claim 5 wherein the drive and
driven wheels are sprockets drivingly connected by a pump chain.

7. The oil pump driving device of claim 5 wherein the
freewheeler clutch is a sprag clutch.

8. The oil pump driving device of claim 5 wherein the
freewheeler clutch is a roller clutch.

9. A hybrid powertrain for a vehicle, said powertrain
comprising:

a first source of torque;

a second source of torque;

5 a hybrid power transmission integrating said first and second
sources of torque and having an input pump shaft rotatable in response to
one of said first and second sources of torque, and a transmission oil pump
drive shaft off-axis from said input pump shaft and including an oil pump
rotor selectively rotatable by said input pump shaft at a first speed; and
10 an electric motor drivably connected to the oil pump drive shaft to
selectively rotate the oil pump rotor at a second speed;

said oil pump rotor being rotatable by said electric motor or said input pump shaft of said transmission in response respectively to which of the first and second speeds is higher.

10. A powertrain for a vehicle, said powertrain comprising:
 - a first source of torque;
 - a second source of torque;
 - a hybrid power transmission integrating said first and second
 - 5 sources of torque and having an input shaft rotatable in response to one of said first and second sources of torque;
 - a pump drive sprocket drivable by said input shaft;
 - a pump-driven sprocket drivable by said pump drive sprocket;
 - a pump drive shaft mounted with respect to said transmission and
 - 10 having an oil pump rotor drivably connected to a first portion of the pump drive shaft, and an electric motor drivably connected to a second portion of the pump drive shaft, and said pump-driven sprocket selectively drivably connected to said pump drive shaft;
 - a pump chain rotatably connecting said pump drive sprocket to
 - 15 said pump-driven sprocket;
 - the rotation of said input shaft in one direction selectively driving said pump-driven sprocket to drive said oil pump rotor; and
 - said pump drive shaft being driven by the electric motor when said input shaft is not rotating in said one direction.

11. The powertrain of claim 10 including a freewheeler clutch operable between the pump drive shaft and the pump-driven sprocket.

12. The powertrain of claim 11 wherein the freewheeler clutch is operable to drive the pump drive shaft when the oil pump shaft is not being rotated by the electric motor.